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SHORT-HAIR SEDGE. . .

its condition in the high Sierra Nevada of California

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Short-hair sedge *(Carex exserta* Mkze.*)* dominates that vegetation type in the high Sierra Nevada of California. One island and 10 mainland sites in Sequoia and Kings Canyon National Parks were sampled to get a representative measure of foliar cover and standing crop. On the mainland sites, foliar cover averaged 29 percent; litter, 38 percent; and soil, gravel, and rock, 33 percent. On the island site, foliar cover averaged 74 percent; and litter, 25 percent. The standing crop on the island site was 208 grams per square meter–more than four times that found on the other sites. The appearance of a site near Kearsarge Pass, Kings Canyon National Park, in 1972 was compared to that more than 70 years earlier. These results suggest the possibility of past misuse and an extremely low rate of recovery.

Oxford: 175.2 *Carex exserta* (794): 187x211.2: 532.
Retrieval Terms: Carex exserta; foliar cover; standing crop; forage plants; Sequoia National Park; Kings Canyon National Park.

Short-hair sedge *(Carex exserta* Mkze.*)*, the dominant component of the short-hair sedge vegetation type, ranks as the most frost-resistant forage in the high Sierra Nevada of California. Its herbage is high in carbohydrates and proteins,[1] and a dense short-hair sedge sod helps control erosion.

The sod is tough and can withstand considerable use, but continued misuse–either by livestock or by people–will break and eventually destroy it *(fig. 1)*. And because rate of recovery at high elevations is slow,[2] many years are needed to rebuild the sod once it has broken.

In Sequoia and Kings Canyon National Parks, the short-hair sedge type is usually found at elevations above 8,000 feet (2,438 meters) and on dry gravelly soils.[1] Short-hair sedge does well there because it begins growth early in the season and then turns dormant in summer when moisture becomes limiting.

Before and during the Parks' early days, sheep apparently grazed the short-hair sedge type heavily.[3] By 1930, grazing by sheep and cattle was essentially eliminated from the Parks, but since then grazing by pack stock has increased. Pressure has also come from droves of people who visit the back country.

Even though the short-hair sedge type is an important resource, basic data about it are scant. To fill the gap, I studied short-hair sedge sites in Sequoia and Kings Canyon National Parks. One island and 10 mainland sites were selected to provide a representative sample of the foliar cover and standing crop for the type.

I found that low foliar cover values were a common condition of short-hair sedge sites in the two National Parks. On 10 of the 11 sites, foliar cover averaged only 28.8 percent. On the eleventh site, however, a small area on the island, it averaged 74 percent.

Figure 1—Continued misuse can destroy the short-hair sedge sod, leaving a patch of bare gravel. A site at Bullfrog Lake in the Kings Canyon National Park, California, illustrates this condition.

METHODS

The 11 sites selected were as follows: One at Kearsarge Lakes; two at Bullfrog Lake; four (including the island site) at Rae Lakes; and one above Bubbs Creek near Vidette Meadow—all in Kings Canyon National Park. The other three sites were in Sequoia National Park above Rock Creek. The sites ranged from nearly level benches to steep slopes and from treeless sites to ones having scattered lodgepole pine *(Pinus Murrayana* Grev. & Balf. in A. Murr.*)*.

On each site I set out 1-square foot (0.09 square meter) plots at regular intervals along lines placed to give a representative sample. The number and length of lines varied with the size of the site. Twenty plots were set out on most sites. Owing to their small size, however, 10 plots were set out on each of two sites along Rock Creek. Only five plots were set out on the island at Rae Lakes.

Each plot was photographed stereoscopically by using the equipment described by Ratliff and Westfall.[4] The plots were then clipped to a stubble height of about one-half-inch (1¼ centimeters) and the herbage bagged.

Herbage samples were oven dried at 70° C. for 48 hours and then weighed to the nearest tenth of a gram. I used the 3½- by 5-inch stereo prints with a 50-dot grid overlay and a pocket stereoscope to estimate foliar cover on each plot. With this technique the plant or surface characteristics the dots hit (or cover) are tallied, by plot.

For each site, I computed the means for standing crop weight and each of nine other characteristics of the short-hair sedge type. The other nine characteristics were: Foliar cover for short-hair sedge, pussytoes *(Antennaria dimorpha* (Nutt.) T. & G.*)*, grasses, and other plants; total foliar cover; litter cover (herbaceous, woody, and animal combined); and cover of

Table 1—*Mean values for characteristics of the short-hair sedge type, by sites, Sequoia and Kings Canyon National Parks, California*

Site	Plants and surface characteristics									
	Short-hair sedge	Pussy-toes	Grass	Other plants	Total foliar cover	Litter	Soil	Gravel	Rock	Standing crop
	Percent cover									*gms/sq. meter*
Bubbs Creek	20.4	–	0.4	0.4	21.2	56.0	4.4	17.6	0.8	16.2
Bullfrog No. 1	14.2	0.4	2.6	4.4	21.6	34.4	4.0	30.0	10.0	26.9
Bullfrog No.2	30.4	1.6	1.6	.4	34.0	37.8	3.6	20.0	4.6	31.1
Kearsarge	26.4	1.4	.2	2.8	30.8	27.2	8.8	31.6	1.6	26.6
Rae Lakes No. 1	30.6	–	1.6	.8	33.0	30.6	4.4	24.2	7.8	35.6
Rae Lakes No. 2	30.8	1.8	2.6	1.0	36.2	56.8	1.2	1.4	4.4	37.2
Rae Lakes No. 3	27.8	–	6.8	1.0	35.6	29.6	.8	28.4	5.6	47.4
Rock Creek No. 1	19.4	–	.6	1.2	21.2	23.2	9.0	44.6	2.0	27.6
Rock Creek No. 2	18.2	–	1.2	–	19.4	47.8	3.4	28.2	1.2	20.0
Rock Creek No. 3	29.2	–	2.2	.2	31.6	43.6	3.2	20.6	1.0	39.3
Island	69.2	–	5.2	–	74.4	24.8	.8	–	–	208.4
Means[1]	24.8	.6	2.0	1.4	28.8	38.0	4.4	24.8	4.0	31.4

[1]Values for island site at Rae Lakes not included in computing means.

soil, gravel, and rock. The grasses encountered were: Western needlegrass *(Stipa occidentalis* Thurb.*)*, squirreltail *(Sitanion hystrix* (Nutt.) J. G. Sm.*)*, and spike trisetum *(Trisetum spicatum* (L.) Richt.*)*. Other plants included pussy paws *(Calyptridium umbellatum* (Torr.) Green.*)*, silver plant *(Eriogonum ovalifolium* Nutt.*)*, lupine *(Lupinus breweri* Gray.*)*, and wire-grass *(Juncus Drummondii* E. Mey.*)*.

For the short-hair sedge type as a whole, I computed the means by using data from all plots from the 10 mainland sites as the sample (N = 180).

RESULTS

The values of the type characteristics for individual, mainland sites *(table 1)* provide a fairly representative sample of the short-hair sedge type in Sequoia and Kings Canyon National Parks. When litter is combined with total foliar cover, the results are similar to those reported by Klikoff.[5] He did not distinguish between these two characteristics. Low foliar cover values are thus a condition of short-hair sedge sites—not only in Sequoia and Kings Canyon National Parks, but apparently in the Sierra Nevada generally.

Values for the standing crops are low when other types of vegetation—especially meadows—in the area are considered. However, the low standing crop values are a condition related to low foliar cover values.

On moderate to steep short-hair sedge sites in Yosemite National Park, Klikoff[5] found steps running at right angles to the slope. These steps resembled a staircase. The leading third of each step was covered with short-hair sedge; the rest of each step was covered with gravel. On more gentle slopes these steps were not distinct. There, areas of short-hair sedge and gravel alternated. Occurrence of the patterns on and

Figure 2—The head basin of north branch of Bubbs Creek and Kearsarge Pass, Kings Canyon National Park, as photographed by George B. Sudworth on September 7, 1900.

Figure 3—A view similar to that photographed by George B. Sudworth *(fig. 2)* shows only slight changes in the appearance of short-hair sedge more than 70 years later.

degradation of short-hair sedge sites were attributed to rodents and erosion. During the present study I observed the same kinds of patterns on short-hair sedge sites in Sequoia and Kings Canyon National Parks.

A result of these patterns is that sites of short-hair sedge usually appear patchy. The low foliar cover and standing crop values are related to the patchiness of the type. That this patchy appearance existed in 1900 and persists more than 70 years later is evident in comparing photographs *(figs. 2, 3)*.

The island site at Rae Lakes was not patchy; foliar cover there was 74 percent *(table 1)*. If litter is added, 98.2 percent of the surface was covered. The standing crop weight there was more than four times greater than that on any of the mainland sites. This island site may represent pristine conditions of the short-hair sedge type. It is, however, low-lying, and may have a more favorable moisture regime than most mainland sites.

DISCUSSION

In most of the 11 sites studied, the foliar cover was light, the weight of the standing crop was low, and there was considerable patchiness. Are these conditions the result of past misuse or are they natural phonemena of the short-hair sedge type? These conditions were not found on the island, past sheep use was heavy, and continued misuse can destroy the sod. Therefore, I suspect past misuse is the cause. If this suspicion is confirmed, then a comparison of the appearance of short-hair sedge more than 70 years apart—in 1900 (as photographed by George B. Sudworth [*fig. 2*]) and in 1972—suggests an extremely

low rate of recovery for this vegetation type.

By comparing the type means with those for individual sites, one can gain an idea of the relative health of the sites studied. But more data and information than obtained from this study are needed to develop procedures to rate the health and trend in health of short-hair sedge sites. Such procedures must be developed for proper management of these sites.

Future studies should determine the proper utilization for the type and should develop ways for improving badly deteriorated sites where nature and management cannot do the job within a reasonable time.

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NOTES

[1]Bennet, Peter S. *An investigation of the impact of grazing on ten meadows in Sequoia and Kings Canyon National Parks.* 1965. (Unpublished master's thesis on file at California State Univ., San Jose, Calif.)

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The Station's range-wildlife environmental research unit, headquartered at Fresno, California, is developing the scientific base for multiple-use management of central California ecosystems. This report adds a facet of knowledge for the ecosystem of the Sierra Nevada foothills.

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